

42nd Annual Meeting of the International Neuropsychological Society (INS) in Seattle, Washington on February 12-15, 2014

Title: Cognitive Function Related to Environmental Exposure to Manganese

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Background: The towns of Marietta and East Liverpool (EL), Ohio, have been identified as having elevated manganese (Mn) in air due to industrial pollution.

Objectives: To evaluate relationships between environmental Mn (Mn-air) exposure and distance from the source and cognitive function in residents of two Ohio towns.

Methods: Data were obtained from an EPA-sponsored study comparing two towns exposed to Mn-air (Marietta and EL). A cross-sectional design was used. The same inclusion/exclusion criteria and procedures were applied in the two towns. A neuropsychological screening test battery was administered to study participants (EL=86, Marietta=100) which included Stroop Color Word Test, Animal Naming, Auditory Consonant Trigrams (ACT) and Rey-O. To estimate Mn-air, U.S.EPA's AERMOD dispersion model was used. Distance from source was calculated based on participants' residential address and air miles from industrial facility emitting Mn-air. A binary logistic regression model controlling for annual household income was used to examine distance from source and neuropsychological outcomes

Results: There were no age, sex, or employment status differences between the two towns. Years education was lower in EL (mean (M)=12.9) than Marietta (M=14.6) and years residency in

town were higher in EL (M=47.0) than Marietta (M=36.1). EL participants resided closer to the Mn source than Marietta (M=1.12 vs M=4.75 air miles). Mn-air concentrations were higher in EL (M=0.269 $\mu\text{g}/\text{m}^3$; range 0.10 to 23.0 $\mu\text{g}/\text{m}^3$) than Marietta (M=0.184 $\mu\text{g}/\text{m}^3$; range 0.04 to 0.96 $\mu\text{g}/\text{m}^3$). There were significant town differences on tests of category fluency, immediate memory, and speed of word reading; the EL group had the lowest scores. Closer distance to the source significantly increased the odds of impairment ($\leq 2\text{nd}\%$) on ACT 9' delay [OR=1.26, 95% CI: 1.02-1.55, $p=.032$], on ACT 18' delay [OR=1.44, 95% CI: 1.11-1.87, $p=.006$], as well as on Rey-O copy raw score [OR=1.27, 95% CI: 1.01-1.61, $p=.043$].

Conclusions: Increased risk of impairment in delayed memory with distraction and visuospatial/executive function were related to residing closer to the Mn source. Environmental exposures are low compared to occupational exposures and small positive findings may be possible early effects of Mn.

This abstract does not necessarily reflect EPA policy.